PATENT SPECIFICATION

658,291

Date of filing Complete Specification Aug. 24, 1949.

Application Date Aug. 26, 1948. No. 22468/48

Complete Specification Published Oct. 3, 1951.

Index at acceptance:—Classes 108(iii), M2a; and 136(iii), B1i(2: 6).

PROVISIONAL SPECIFICATION

SPECIFICATION NO. 658291

INVENTOR:- VALENTINE PAGE

By a direction given under Section 17(1) of the Patents Act 1949 this application proceeded in the name of The Birmingham Small Arms Company Limited, a British Company, of Armoury Road, Small Heath, Birmingham.

THE PATENT OFFICE
8th October, 1951

DS 95062/1(14)/3580 160 9/51 R

will provide effective damping in two directions, which is of simple construction and which is adapted to limit the movement of the wheel in each direction.

According to this invention a device of the kind referred to comprises an inner closed hydraulic cylinder, secured to the frame of the motor cycle and provided with a lateral external partition and one or more openings a short distance from each side of the partition, an outer hydraulic cylinder surrounding the partition and movable with the resiliently-mounted road-wheel of the cycle, and a hollow piston at each end of, and movable with, the outer hydraulic cylinder and surrounding the inner cylinder so that on movement of the outer hydraulic cylinder (caused by substantially vertical movement of the road wheel) the liquid in it is displaced from one side of the partition to the other through the openings in the inner cylinder until the appropriate hollow piston reaches and covers the opening nearest to it, thereby limiting or preventing further movement in that direction of the second hydraulic cylinder and the road wheel to which it is secured.

The resilient mounting for the road wheel is preferably in the form of a helical compression spring and may conveniently be mounted between the bracket supporting the upper end of the inner cylinder and the member carrying the outer cylinder.

[*Price 2/-*]

cycle. A filler plug is provided at the top of the cylinder and the bottom of the cylinder is closed by a plug or cover. At a point roughly mid-way its length the cylinder is provided with an external circumferential collar, which forms a partition in the outer cylinder (which is hereinafter described). A short distance above the collar an opening is provided in the cylinder and a corresponding opening is provided at a short distance below the collar. These openings are of a suitable size to give the desired damping effect and are preferably provided with a tapered recess in known manner on the surface of the cylinder for a purpose to be hereinafter explained.

Surrounding the partition-collar is an outer cylinder which is carried by the lug in which the wheel spindle is mounted. Towards each end of this cylinder is a hollow piston which surrounds the inner cylinder. The outer ends of the pistons are provided with liquid-tight seals, such as those of the cup washer type, and caps, screwing on to the outer cylinder, serve to retain the seals in position.

Surrounding the outer cylinder and mounted between the wheel-spindle lug and the projection from the frame is a compression spring which is provided with a telescopic shroud.

The lower part of the device, i.e. that part below the wheel spindle lug is also provided with a telescopic shroud, a light

Price 4s 6d

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PROVISIONAL SPECIFICATION

Improvements in or relating to Hydraulic Damping Devices

We, THE BIRMINGHAM SMALL ARMS COMPANY LIMITED, a Company duly incorporated under the laws of Great Britain, of Armoury Road, Small Heath, Birmingham, and VALENTINE PAGE, a British Subject, of the aforesaid Company's address, do hereby declare the nature of this invention to be as follows:—

This invention relates to hydraulic damping devices of the dashpot type for use in connection with the suspension of wheels of motor cycles.

It is an object of the invention to provide a device of the kind described which will provide effective damping in two directions, which is of simple construction and which is adapted to limit the movement of the wheel in each direction.

According to this invention a device of the kind referred to comprises an inner closed hydraulic cylinder, secured to the frame of the motor cycle and provided with a lateral external partition and one or more openings a short distance from each side of the partition, an outer hydraulic cylinder surrounding the partition and movable with the resiliently-mounted road-wheel of the cycle, and a hollow piston at each end of, and movable with, the outer hydraulic cylinder and surrounding the inner cylinder so that on movement of the outer hydraulic cylinder (caused by substantially vertical movement of the road wheel) the liquid in it is displaced from one side of the partition to the other through the openings in the inner cylinder until the appropriate hollow piston reaches and covers the opening nearest to it, thereby limiting or preventing further movement in that direction of the second hydraulic cylinder and the road wheel to which it is secured.

The resilient mounting for the road wheel is preferably in the form of a helical compression spring and may conveniently be mounted between the bracket supporting the upper end of the inner cylinder and the member carrying the outer cylinder.

[*Price 2/-*]

The device is preferably encased by telescopic members, which may conveniently be in two pairs, one pair enclosing the part of the device above the member carrying the outer cylinder and the other pair enclosing the part below that member.

In a preferred construction, given by way of example, for use in connection with the suspension of the rear wheel of a motor cycle the inner hydraulic cylinder is mounted substantially vertically and supported at the top and bottom by projecting members from the frame of the cycle. A filler plug is provided at the top of the cylinder and the bottom of the cylinder is closed by a plug or cover. At a point roughly mid-way its length the cylinder is provided with an external circumferential collar, which forms a partition in the outer cylinder (which is hereinafter described). A short distance above the collar an opening is provided in the cylinder and a corresponding opening is provided at a short distance below the collar. These openings are of a suitable size to give the desired damping effect and are preferably provided with a tapered recess in known manner on the surface of the cylinder for a purpose to be hereinafter explained.

Surrounding the partition-collar is an outer cylinder which is carried by the lug in which the wheel spindle is mounted. Towards each end of this cylinder is a hollow piston which surrounds the inner cylinder. The outer ends of the pistons are provided with liquid-tight seals, such as those of the cup washer type, and caps, screwing on to the outer cylinder, serve to retain the seals in position.

Surrounding the outer cylinder and mounted between the wheel-spindle lug and the projection from the frame is a compression spring which is provided with a telescopic shroud.

The lower part of the device, i.e. that part below the wheel spindle lug is also provided with a telescopic shroud, a light

Price 4s 6d

spring being provided between the cap on the lower end of the outer cylinder and the upper telescopic part in order to maintain the latter in position.

When the device is in operation, the raising of the road wheel causes the wheel spring to be compressed and at the same time causes the outer cylinder with its pistons to be raised. The liquid in the lower part of the outer cylinder is thus displaced, passing through the lower opening in the inner cylinder, through the inner cylinder and through the upper opening in the inner cylinder into the upper part of the outer cylinder. If the movement of the road wheel is sufficient, the lower piston will reach the lower opening in the inner cylinder and will first cover the hole, but, owing to the tapered recess, the hole will not at first be completely sealed but, as the piston progresses over the tapered recess, the opening will be effectively sealed and further appreciable movement of the outer cylinder in that direction will be prevented, although slight movement may take place because of leakage between the partition and the outer cylinder. By this arrangement the limit of movement to the outer cylinder is gradually applied. On the rebound of the spring or when the road wheel moves in a downward direction the outer cylinder will move in the same direction and the upper piston will co-operate with the upper opening in the central tube in the same manner as that described for the lower piston and lower opening.

Dated this 25th day of August, 1948.

NORMAN H. BUCKLEY,
Chartered Patent Agent.

COMPLETE SPECIFICATION

Improvements in or relating to Hydraulic Damping Devices

We, THE BIRMINGHAM SMALL ARMS COMPANY LIMITED, a Company duly incorporated under the laws of Great Britain, of Armoury Road, Small Heath, Birmingham, and VALENTINE PAGE, a British Subject, of the aforesaid Company's address, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to hydraulic damping devices of the dashpot type for use in connection with the suspension of wheels of motor cycles.

For the purpose of providing hydraulic shock absorbers with an effective damping in two directions, it is already known to provide a double acting oil or other fluid dashpot device which damps both the initial compression shock and the rebound, such dashpot device including in combination therewith a spring or rubber compression element. In such shock absorbers it has been proposed to construct the dashpot device in the form of telescoping inner and outer tubes with a ring piston secured to the inner tube creating two annular chambers between the tubes, holes being formed in the wall of the inner tube on either side of the ring piston whereby relative movement between the inner and outer tubes in both directions is damped out by the resistance provided in the interchange of oil between the annular chambers.

It is an object of the present invention to provide an improved and simplified construction of hydraulic damping device providing effective damping in two directions, which is particularly applicable to the rear wheel suspension of motor cycles and is adapted to limit the movement of the wheel in each direction.

According to this invention a device of the kind referred to comprises a fixed inner hydraulic cylinder provided with lateral openings, an outer closed hydraulic cylinder surrounding and movable relative to the inner cylinder, a lateral partition located in the outer cylinder which partition forms an external part of the inner cylinder and is disposed between at least two of the openings therein, and hollow pistons movable with the outer hydraulic cylinder adapted to surround the inner hydraulic cylinder and co-operate with said openings, so that on movement of the outer hydraulic cylinder (caused by substantially vertical movement of the road wheel) the liquid in it is displaced from one side of the partition to the other through the openings in the inner cylinder until the appropriate hollow piston reaches and covers the opening nearest to it, thereby limiting or preventing further movement in that direction of the outer hydraulic cylinder and the road wheel to which it is secured.

A resilient mounting for the road wheel is preferably in the form of a helical compression spring and may conveniently be mounted between the bracket supporting the upper end of the inner cylinder and the member carrying the outer cylinder.

The device is preferably encased by telescopic members, which may conveniently be in two pairs, one pair enclosing the part of the device above the member carrying the outer cylinder and the other

pair enclosing the part below that member.

In the accompanying drawings:—

Figure 1 is a part sectional side elevation of a hydraulic damping device embodying the features of the present invention.

Figure 2 is a view similar to Figure 1 but illustrating the position assumed by the movable parts of the mechanism on extreme upward deflection.

Referring now to the drawings illustrative of a construction, given by way of example, for use in connection with the suspension of the rear wheel of a motor cycle the inner hydraulic cylinder 1 is mounted substantially vertically and supported at the top and bottom by projecting portions 3 and 5 from the frame member 7 of the cycle. A filler plug 9 is provided at the top of the cylinder 1 and the bottom of the cylinder is closed by a plug or cover 11. At a point roughly mid-way its length the cylinder 1 has formed on or fixed thereto an external circumferential collar 13 for the purpose hereinafter described, while a short distance above the collar 13 an opening 15 is provided in the cylinder 1 and a corresponding opening 17 at a short distance below the collar. These openings 15 and 17 are of a suitable size to give the desired damping effect and may be provided with a tapered recess in known manner on the surface of the cylinder for a purpose to be hereinafter explained.

Surrounding the collar 13, which is secured to the cylinder 1 by a rivet 14, is an outer cylinder 19 to which is clamped or otherwise secured a lug or bracket 21 having a slot 23 in which the wheel spindle is mounted. Towards each end of the cylinder 19 are mounted hollow pistons 25, 26 which surround and contact with the inner cylinder 1. The outer ends of the pistons 25, 26 are provided with liquid-tight seals 27, and caps 29, screwing on to the outer cylinder 19, serve to retain the seals in position.

Surrounding the inner and outer cylinders 1 and 19 and disposed above the lug or bracket 21 is a compression spring 31 mounted between seatings 33 abutting against the projecting portion 3 of the frame member 7 and the bracket 21, said spring being enclosed by a telescopic cover or shroud 35.

The lower part of the device, i.e. that part below the bracket 21 is also fitted with a telescopic cover or shroud 37, a light spring 39 being provided in order to maintain the cover members in position during movement of the bracket 21 relative to the portion 5 of the frame member 7.

In order to soften the possible impact of the outer cylinder 19 with the projecting portions 3 and 5 of the frame member 7 on an extreme deflection of the road wheel, as seen in Figure 2, resilient buffers 41 are provided.

Finally both the inner and outer cylinders 1 and 19 in the assembled mechanism are completely filled with a suitable oil.

When the device is in operation, upward deflection of the road wheel raises the bracket 21 thereby causing the spring 31 to be compressed and at the same time raises the outer cylinder 19 with its pistons 25, 26. The liquid in the lower part of the outer cylinder 19 is thus displaced, passing into the inner cylinder 1 through the lower opening 17 and out into the upper part of the outer cylinder 19 through the upper opening 15 in the inner cylinder 1, said upper and lower parts of the outer cylinder being determined by the collar 13, which forms a partition in the outer cylinder 19. If the movement imparted to the outer cylinder 19 by the road wheel is sufficient, the lower piston 26 will reach and cover the lower opening 17 in the inner cylinder 1, as seen in Figure 2, and on such opening being effectively sealed further appreciable movement of the outer cylinder 19 in that direction will be prevented, although slight movement may take place because of leakage between the collar 13 and the outer cylinder 19. On the rebound of the compression spring 31 causing the bracket 21 to move the road wheel in a downward direction, the outer cylinder 19 will also be moved in the same direction and the upper piston 25 will co-operate with the upper opening 15 in the inner cylinder 1 in the same manner as that described for the lower piston and lower opening.

If, as in known manner, the openings 15 and 17 are provided with a tapered recess, they will not at first be completely sealed by the respective pistons 25 and 26 but, as the piston progresses over the tapered recess, the limit of movement to the outer cylinder 19 produced by the sealing of the opening will be more gradually applied.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A hydraulic damping device of the kind herein referred to comprising a fixed inner hydraulic cylinder provided with lateral openings, an outer closed hydraulic cylinder surrounding and movable relative to the inner cylinder, a lateral partition located in the outer cylinder which partition forms an external part of th

inner cylinder and is disposed between at least two of the openings therein, and hollow pistons movable with the outer hydraulic cylinder adapted to surround the inner hydraulic cylinder and co-operate with said openings, so that on movement of the outer hydraulic cylinder (caused by substantially vertical movement of the road wheel) the liquid in it is displaced from one side of the partition to the other through the openings in the inner cylinder until the appropriate hollow piston reaches and covers the opening nearest to it, thereby limiting or preventing further movement in that direction of the outer hydraulic cylinder and the road wheel to which it is secured.

2. A hydraulic damping device according to Claim 1, wherein liquid contained in both inner and outer hydraulic cylinders is displaced, on vertical movement of the outer cylinder, from one side of the partition located therein to the other side through the openings in the inner cylinder until the appropriate hollow piston reaches and covers the opening nearest to it, thereby limiting or preventing further movement in that direction of the outer hydraulic cylinder and the road wheel to which it is secured.

3. A hydraulic damping device according to Claims 1 and 2, comprising an inner hydraulic cylinder fixed to the frame member of a motor cycle and an outer hydraulic cylinder to which the road wheel is secured through the medium of a bracket fixed to the outer cylinder, said bracket constituting a support or abutment for one end of a compression spring, the other end of which abuts against the frame member.

4. A hydraulic damping device according to Claim 1, wherein the inner hydraulic cylinder has fixed thereto an external circumferential collar which is disposed substantially equidistantly between openings formed in said cylinder, for the purpose specified.

5. A hydraulic damping device according to Claims 1 and 2, wherein the outer hydraulic cylinder has mounted towards each end thereof hollow pistons adapted to surround and contact with the inner hydraulic cylinder.

6. A hydraulic damping device according to Claim 5, wherein the outer ends of the pistons are provided with liquid-tight seals.

7. A hydraulic damping device according to Claim 3, wherein the inner and outer hydraulic cylinders are protected by telescopic covers or shrouds disposed between the road wheel bracket and the frame member.

8. A hydraulic damping device constructed, arranged and adapted to operate substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 23rd day of August, 1949.

NORMAN H. BUCKLEY,
Chartered Patent Agent.

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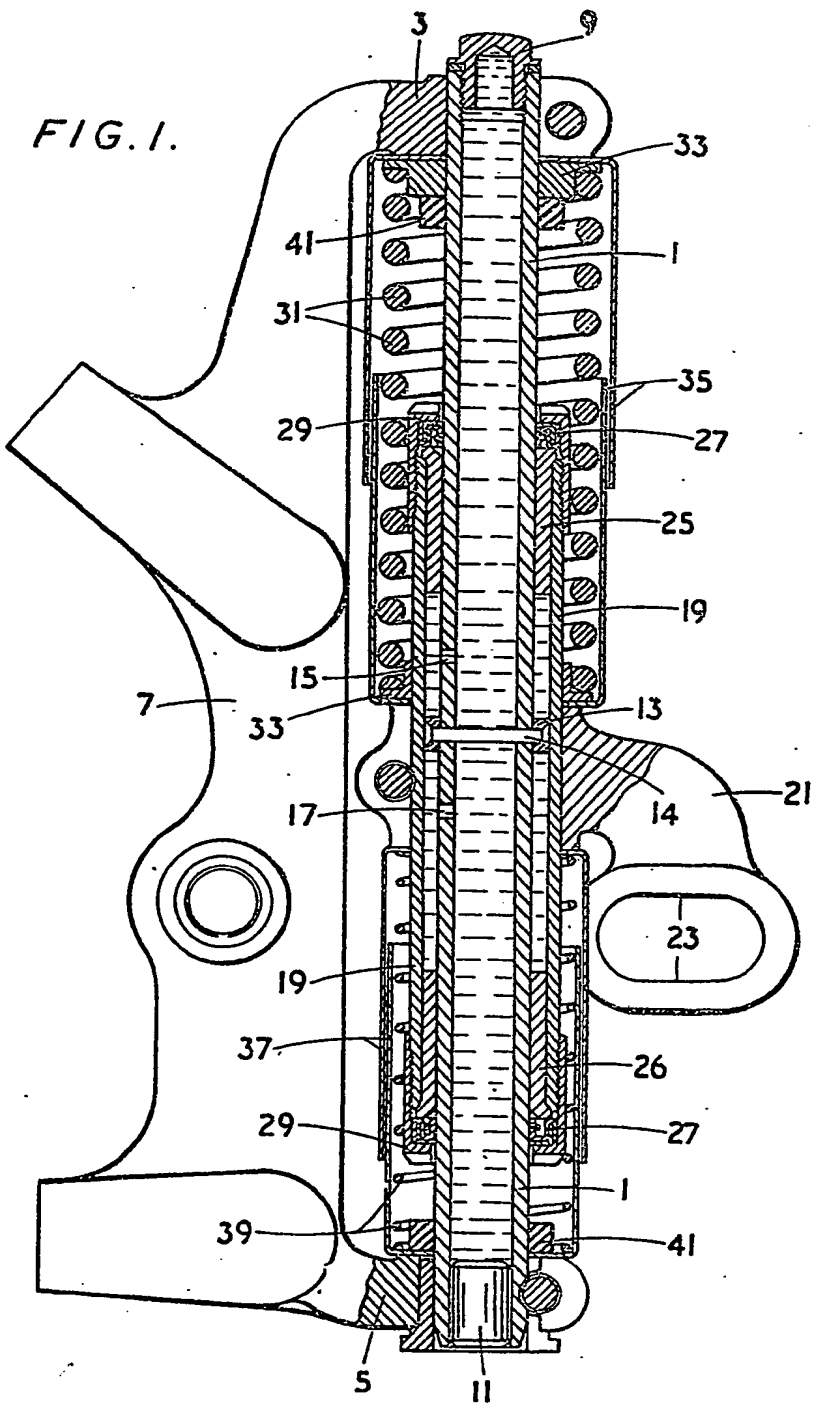
FIG. 1.

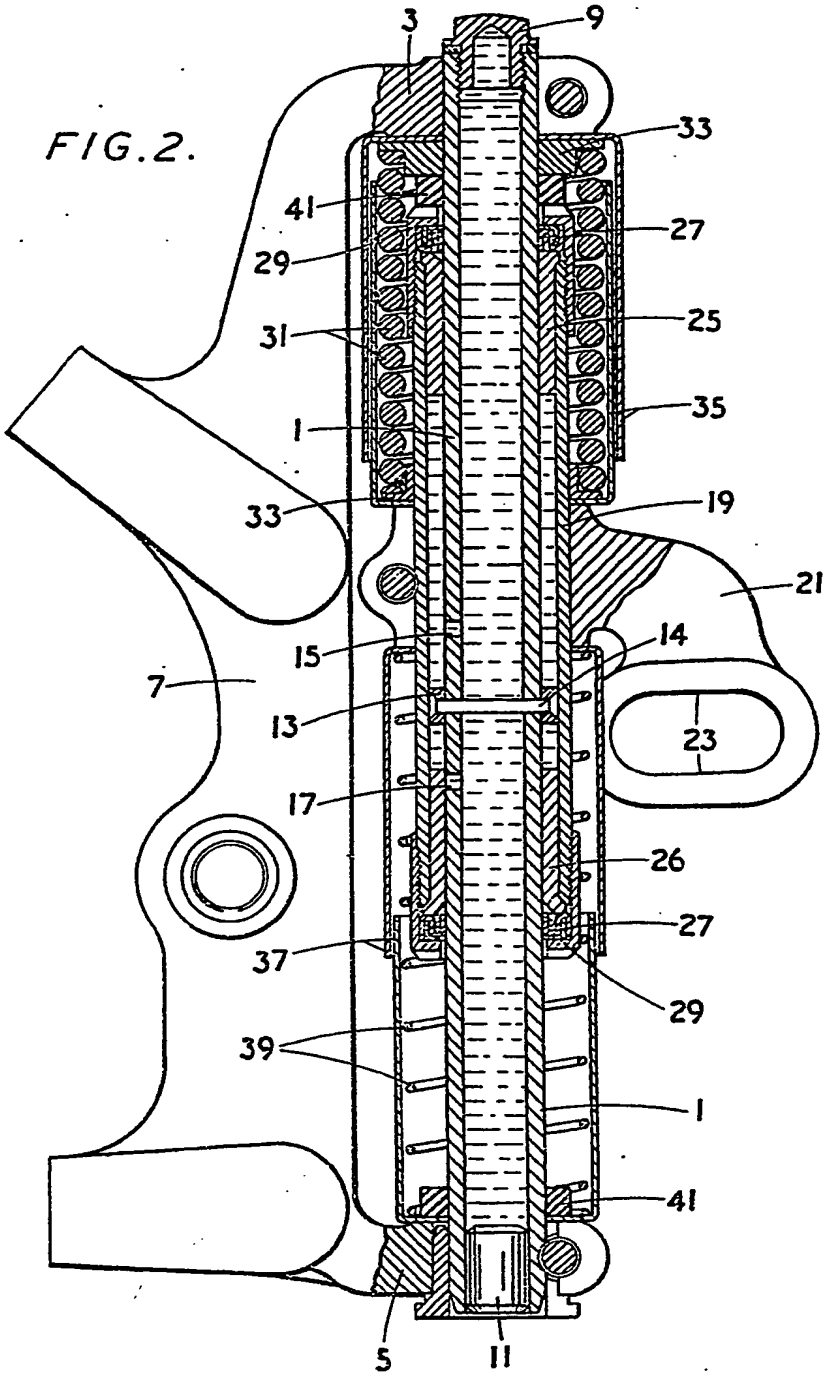


SHEET 1

7

21

FIG.2.



658,291 COMPLETE SPECIFICATION

2 SHEETS

SHEET 1

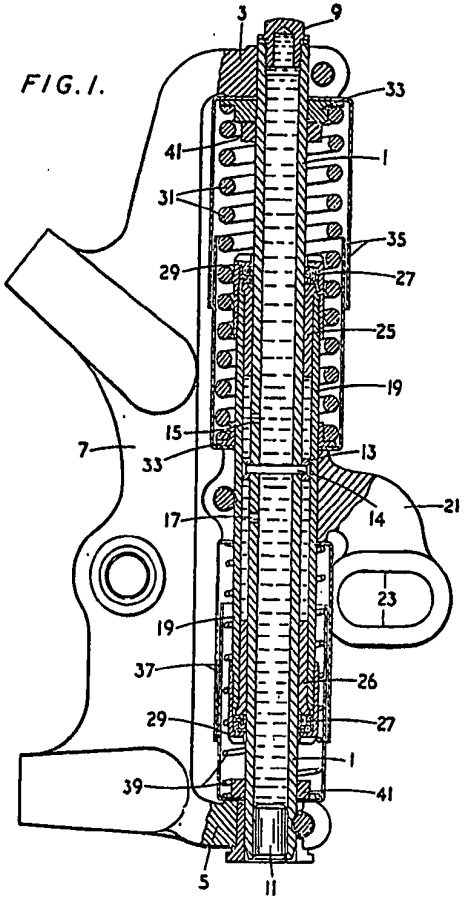


FIG. 1.

SHEET 2

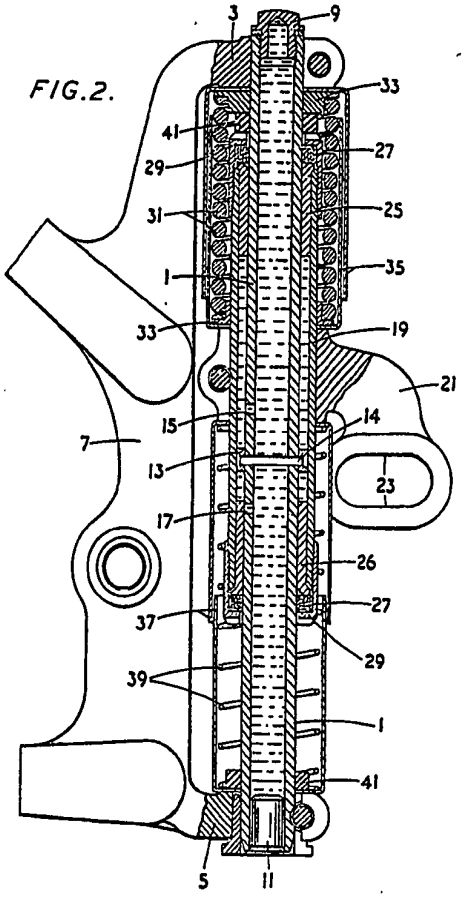


FIG. 2.

H.M.S.O. (M.F.P.)

This Drawing is a reproduction of the Original on a reduced scale

FIG. 1.

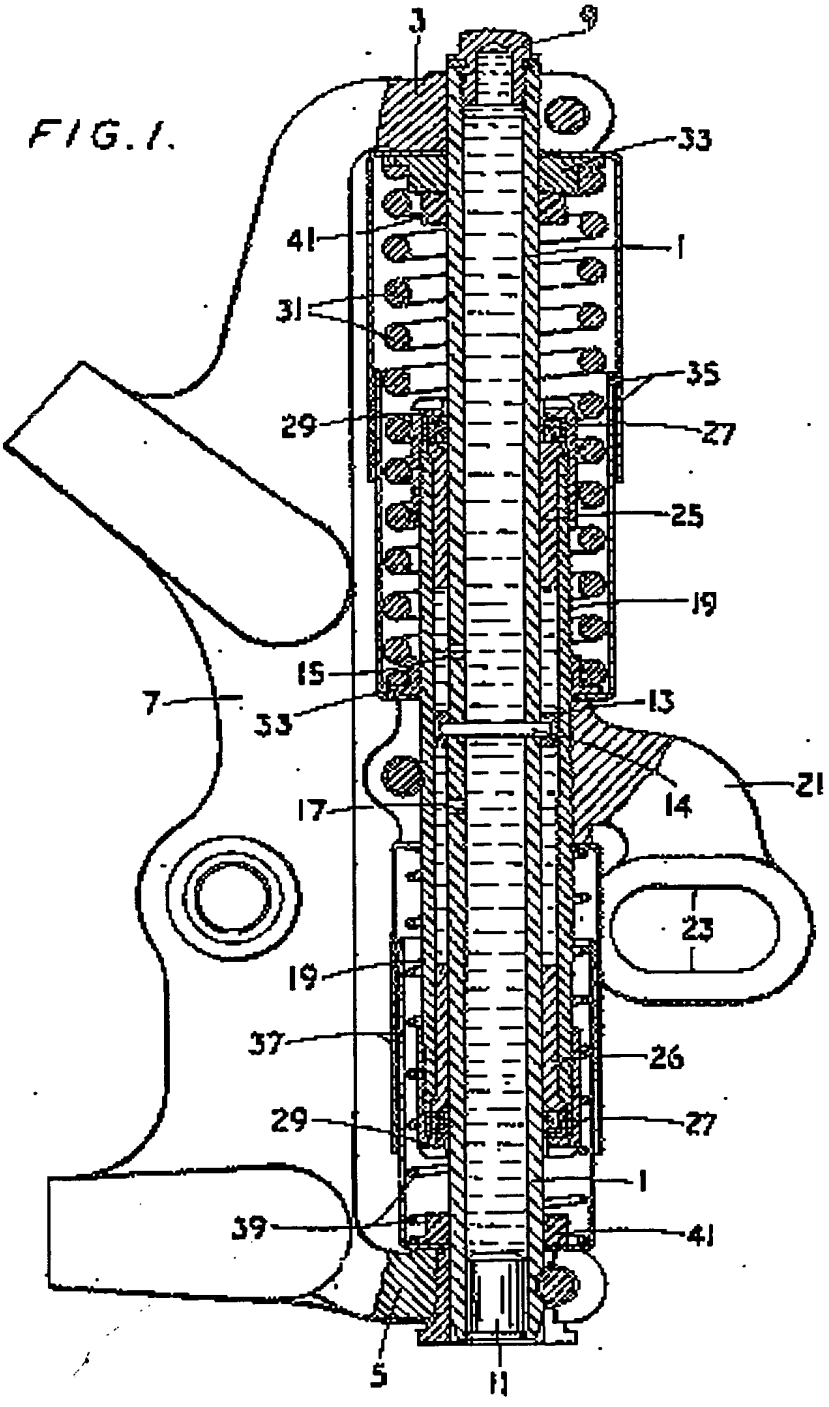
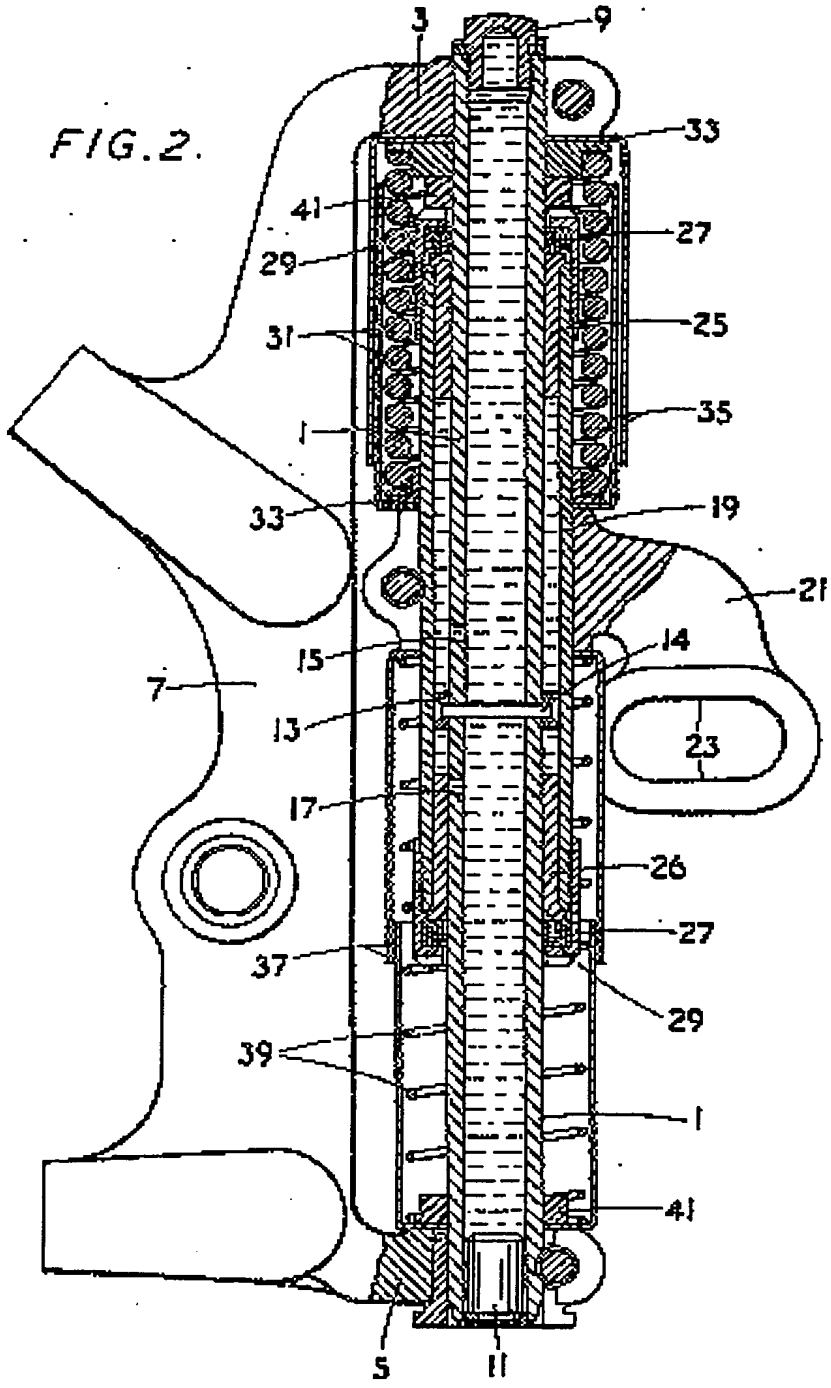
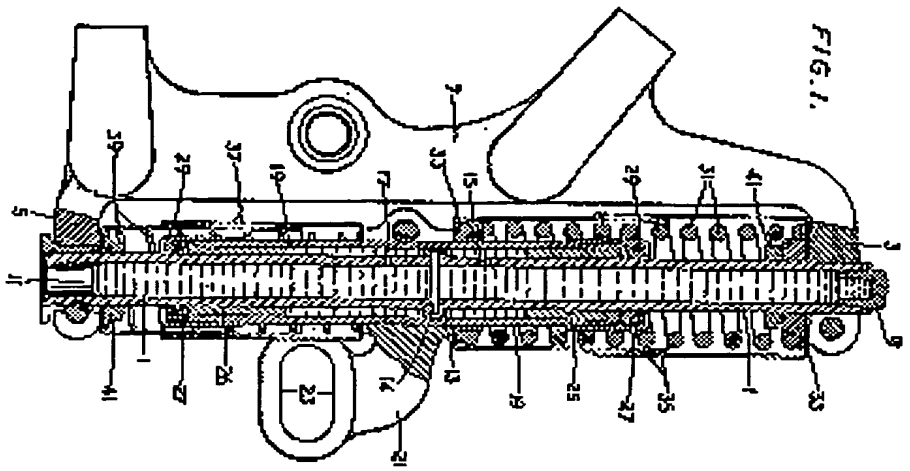


FIG. 2.



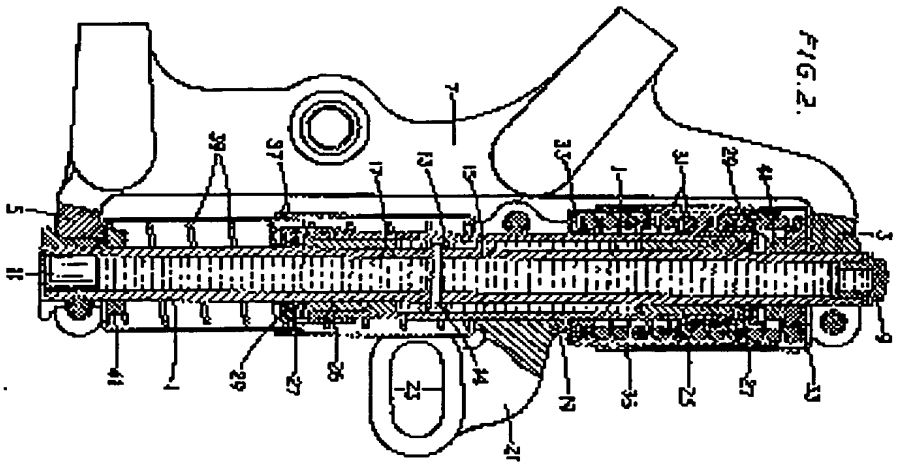
656291 COMPLETE SPECIFICATION

FIG. 1.



SHEET 1

FIG. 2.



2 SHEETS
SHEET 2